



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION:	Trent7000-72C	BYPASS RATIO (-):	8.9
UNIQUE ID NUMBER:	02F23RR142	PRESSURE RATIO $\pi_{co}$ (-):	45.8
COMBUSTOR:	Phase5 Tiled		
ENGINE TYPE:	TF	RATED OUTPUT $F_{oo}$ (kN):	327.9

### REGULATORY DATA

CHARACTERISTIC VALUES:	LTO <sub>mass</sub> /F <sub>oo</sub> (mg/kN)	LTO <sub>num</sub> /F <sub>oo</sub> (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
LTO/F <sub>oo</sub> AND MAX nvPM <sub>mass</sub>	200.1	1.74E+15	3410
AS % OF CAEP/10 LIMIT	-	-	87.0
AS % OF CAEP/11 LIMIT (InP)	57.6	41.7	
AS % OF CAEP/11 LIMIT (NT)	93.5	62.5	

### MEASURED DATA

MODE	POWER SETTING (%F <sub>oo</sub> )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM <sub>mass</sub> ( $\mu\text{g}/\text{m}^3$ )
				EI <sub>mass</sub> (mg/kg)	EI <sub>num</sub> (particles/kg)	
TAKE-OFF	100	0.7	2.502	48.1	1.45E+14	
CLIMB OUT	85	2.2	2.040	84.1	2.83E+14	
APPROACH	30	4.0	0.671	74.0	8.58E+14	
IDLE	7	26.0	0.259	18.8	4.47E+14	
LTO TOTAL (kg, mg, number of particles)			939	47203	4.10E+17	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/F <sub>oo</sub> VALUES (mg/kN, particles/kN)				143.9	1.25E+15	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				152.5	9.62E+14	2649

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (%F <sub>oo</sub> )	CORRECTED EMISSIONS INDICES	
		EI <sub>mass_sl</sub> (mg/kg)	EI <sub>num_sl</sub> (particles/kg)
TAKE-OFF	100	51.6	1.96E+14
CLIMB OUT	85	90.9	4.12E+14
APPROACH	30	85.5	1.92E+15
IDLE	7	22.7	8.92E+14

### AMBIENT CONDITIONS

	From	To	FUEL	
			HEAT OF COMBUSTION (MJ/kg)	
BAROMETER (kPa)	100.8	101.6	43.34	13.97
TEMPERATURE (K)	287.0	292.6		15.9
HUMIDITY (kg water/kg dry air)	0.0080	0.0090		0.11
				300

MANUFACTURER:	Rolls-Royce plc
TEST ORGANIZATION:	Rolls-Royce plc
TEST LOCATION:	Derby
TEST DATES:	04/10/2018

### REMARKS

1. Certification Report EDNS01000740804
2. Correction of minor error in reported nvPM data
3. The maximum EI<sub>mass</sub> occurs between 30% and 85% F<sub>oo</sub>
4. The maximum EI<sub>num</sub> occurs between 30% and 85% F<sub>oo</sub>